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Serial No.: 10/516,984 Docket No.: PF020062

Examiner: Luong Trung Nguyen
Transmittal Form (2 Copies - 2 Pages)

Response to Restriction Requirement (4 Pages)

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Serial No. 10/516,984

PF020062

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Inventors

Petrus Gijsbertus Maria Centen

Serial No.

10/516,984

Filed

December 6, 2004

Title

MULTI-FORMAT CAMERA HEAD

Examiner

Luong Trung Nguyen

Art Unit

2622

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Patricia A. Verlangieri

RESPONSE TO RESTRICTION REQUIREMENT

Restriction to one of the following species is required under

PCT Rule 13.1:

Species I: Figure 1.

Species II: Figure 6.

Species III: Figure 7.

The invention is clearly directed towards combining two different integer multiples of physical lines of a CCD or CMOS imager for providing a vertical resolution corresponding to the NTSC and PAL (or SECAM) television standards.

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According to the NTSC television standard the vertical resolution is 480 lines, and according to the PAL standard the vertical resolution is 575 lines. As discussed in great detail in the specification beginning in line 5 of page 3, the least common multiple of 480 and 575 is 55.200. At the time of the invention there was no commercially available CCD or CMOS image sensor having this vertical resolution. However, the inventors noticed that the least common multiple of 480 and 576 is only 2880, and the ratio of 480 to 576 is exactly 5 to 6. So, using an imager having 2880 lines, a combination of six consecutive lines could be used for producing one line of an image complying with the NTSC standard. Five consecutive lines could be used for producing one line of an image complying with the PAL standard, if one line is discarded. This would allow for using all the lines of the same imager for producing images compliant with either of the standards simply by changing the number of lines that are combined. The error in the imager's field of view introduced to the PAL image when the zoom is not adjusted is smaller than 0.2% and is negligible.

Applicant respectfully disagrees with the examiner that the application contains claims directed to more than one species of the generic invention.

Rather, the generic invention of claim 1 is applicable for different types of CCD or CMOS imagers, notably CCD imagers of the frame-transfer type, CCD imagers of the interline-transfer type, and CMOS imagers, which form embodiments claimed in the dependent claims.

Species I identified by the examiner relates to a frame transfer CCD imager shown in figure 1. In this type of CCD imagers the light-sensitive pixels are grouped in element 2, and light insensitive charge storage areas for each light-sensitive pixel are grouped in element 3. It is common knowledge of the person of ordinary skill in the art that the light-sensitive pixels of element 2 are exposed to implinging light and after the desired exposure time is over, the charges accumulated in the light-sensitive pixels are moved to light insensitive storage regions, from which they are ultimately read out.

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Species II identified by the examiner relates to a frame transfer CCD imager as shown in figure 6. In this type of CCD imagers the light-sensitive pixels are grouped in element 2. In contrast to the CCD imager shown in figure 1 this embodiment of a CCD imager does not provide charge storage areas for each light-sensitive pixel. Rather, the number of charge storage areas corresponds to the maximum resolution of a video image that is to be output. In this case, the charge storage areas would correspond to the PAL resolution, which has 575 vertical lines. During readout of the CCD imager for obtaining images according to the PAL standard, during transfer of the charges accumulated in the lightsensitive pixels during exposure to the light insensitive storage area, charges of pixels from 5 consecutive lines are combined into one charge, which is then stored in one line of the charge storage area. In the case of reading out the CCD imager for obtaining images according to the NTSC standard, and during transfer of the charges accumulated in the light-sensitive pixels during exposure to the light insensitive storage area, charges of pixels from 6 consecutive lines are combined into one charge, which is then stored in one line of the charge storage area. The charges transferred to the light insensitive storage area then read out for producing a video signal. This particular embodiment reduces the number of charge storage elements at the cost of flexibility for producing images having different resolutions.

Species III identified by the examiner relates to an interline transfer CCD sensor as shown in figure 7. In this type of CCD sensor light insensitive charge storage areas are provided next to the light-sensitive elements in the form of vertical columns. After exposure the charges are transferred into the vertical columns, from which they are shifted one after another to a horizontal readout register. However, this type of CCD sensor also allows for combining charges during transfer of the charges in the vertical columns.

In view of the discussion above it is submitted that the type of CCD image sensor is irrelevant to the finding of the invention that instead of using 575

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vertical lines for the PAL standard 576 lines may be used, because it is irrelevant where the combination of the charges is effected.

As it seems necessary to make an election, in response to the restriction requirement, we hereby elect Species I, with claims 1-15, with traverse.

Respectfully submitted,

Patricia A. Verlangieri, Attorney

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July 7, 2008